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Effect of Orthodontic Retainers on Periodontal Health – A Systematic Review.

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ABSTRACT

Orthodontic retainers are used to control the new position and occlusal relationships achieved with orthodontic treatment. It helps in stabilisation of tissues after removal of orthodontic appliances. But, can affect periodontal health as maintenance of proper hygiene becomes difficult due to plaque accumulation. Literature search was conducted to evaluate effect of orthodontic retainers on periodontal health. Studies in English and full texts were assessed after fulfilling the eligibility criteria. Eight articles were assessed for periodontal outcomes such as Plaque Index, Calculus Index, Bleeding on probing and clinical attachment loss in patients wearing fixed or removable orthodontic retainers. Long term usage of retainers negatively impacted periodontal health. No significant difference was noted in patients with orthodontic retainers and those without. Further studies with prospective study designs are recommended to analyse the effect of retainers on gingival and periodontium.

Keywords: orthodontic retainers, periodontal health, fixed retainer, removable retainer

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INTRODUCTION

Orthodontic treatment faces the challenge of long term stability, urging orthodontists to attempt techniques to provide stable results. Studies have mentioned various treatment techniques to reinforce treatment stability[1,2]. Mandibular anterior crowding can result as if retention procedures were inadequate following an orthodontic treatment or as an age related characteristic changes[3]. Hence, retention procedures are continually experimented by researchers. Both fixed and removable retainers are in use to maintain mandibular incisor alignment.

Various forms of retention is practiced across the globe on the basis of individual preference. Geographical variations are reported by a review for retention method usage[4]. The most popular form in US is the maxillary Hawley or vacuum formed retainers and fixed lingual retainers for the mandible. Maxillary vacuum formed and mandibular fixed retainers are used in combination in New Zealand and Australia. Netherlands opts for fixed retainers in both.

Orthodontic retainers are generally placed for an indefinite duration to minimize relapse and maturational changes[5]. These retainers increase the likelihood of plaque retentive areas, thus provoking gingival reaction progression resulting in increased periodontal tissues inflammation and damage[6]. Hence, this review was conducted to evaluate the effect of long term implications of fixed or removable orthodontic retainers on periodontal health.

METHODOLOGY:

The study was done with the research question "Do fixed orthodontic retainers have an effect on periodontium" in mind, which followed the PICO format. Population examined was orthodontically treated patients with retention appliance, Intervention was fixed retainers, comparison was to that of the general population and outcome evaluated was periodontal health.

Literature Search:

Databases of Pubmed, Scopus and Journal of Web were searched for literature. Only articles published in English with no restriction to the year of publication were searched by the author. Key terms used for the search were: "fixed retainers" OR "orthodontic treatment" OR "retention" OR "periodontal health" OR gingival health". In addition, hand search of reference lists and contacting authors when full text articles were not available was also done. Endnote software was utilized to remove duplicate studies of same type.

Eligibility criteria:

Those papers which recorded the effect of orthodontic retainers on periodontal health as a primary outcome were only included. Unpublished conference proceedings and state of art

reports were excluded. All studies (randomized and non-randomized control trials, cohort and case reports) with a long term retainers placed following orthodontic therapy.

***Data extraction*:**

All the articles were reviewed by the author. When full texts of articles were available, screening for eligibility was done. Variables evaluated were: Study year, sample, age of sample, groups and outcome assessed.

Quality assessment:

The Cochrane collaboration's Risk of bias tool[7] was employed to assess the quality of the articles chosen. Sequence generation, allocation concealment, blinding of outcome assessors, incomplete outcome data, selective reporting and other biases were the items which were graded.

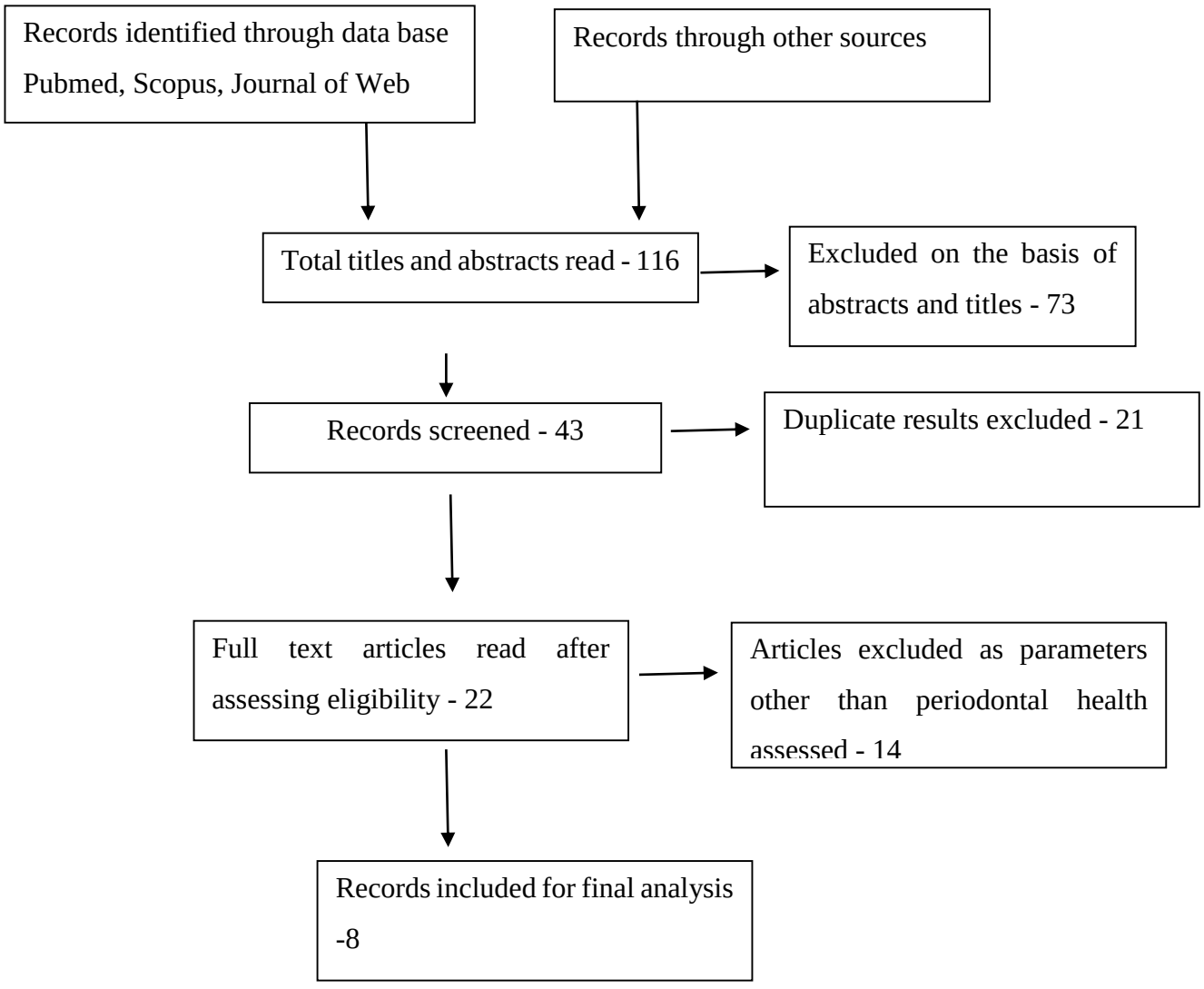

Figure 1: Flow chart of articles included for the study

RESULTS AND DISCUSSION

A total of 8 studies were included for the review. The process of selection of articles for the review is depicted in Figure 1. Out of the 8 studies reviewed, four were longitudinal studies, 3

were of concurrent parallel design RCT and 1 was a cross sectional study. As orthodontic treatment is taken in the younger ages, most of the study population belonged to younger ages. No conclusive effect of retainers on periodontal health was determined. Periodontal outcome was measured by various indices such as plaque index, gingival index, calculus index, Bleeding on probing and clinical attachment loss. One study even assessed GCF as a biological marker. A detailed description of characteristics of articles assessed is presented in Table 1

Table 1: Characteristics of the articles included

Study	Design	Group	Sample	Type of retainer	Follow up	Outcome
Andrew Corbett et al, 2015[8]	Parallel design RCT	Group 1 – subjects placed with fixed straight retainer Group 2 – Subjects placed with fixed wave retainer	39 + 35 (13 – 22 years)	Fixedretainer between lower canine to canine	2 – 4 years	Though Gingival inflammation was seen in both groups, no difference was noted between 2 groups. Significant increase in reported flossing frequencies were seen in group 2.
Sepideh Torkan et al, 2014[9]	Randomised parallel study	Group 1 – Fiber reinforced composite retainer Group 2 – Spiral wire retainer	30	Fixed retainer, in maxillary and mandibular arch (canine to canine)	6 months	Scores of PI, CI, GI and BOP were worse for fiber reinforced group than the other. No significant difference was noted between the groups in periapical radiographs.
Wellington J Rody et al, 2011[10]	Longitudinal study	Gp 1 – 10 patients with fixed retainers. Gp 2 – 11 patients with removable retainers Group 3 - controls	31 (17 men and 14 women between 20 – 35 years)	Group I – fixed mandibular retainer of 0.028 inch round stainless steel wire Group II – removable lower Howley type retainers Group III – Prosthodontic patients as controls	4- 10 years (mean – 5.6 years)	PI and GCF collection. No difference in gingival bleeding and probing depth. Increased GCF levels of MMP – 9 from lower incisor sites in fixed retainer group suggested subclinical inflammation
Liu et al, 2010[11]	Parallel design RCT	Grup 1 -0.75mm fiber reinforced composite fixed retainer Group 2 – 0.9 mm multistrand stainless steel fixed retainer	40 patients	Mandibular anterior teeth	12 months	BI, Pocket depth. No significant difference between the groups.

Jao Batista Cesar Neto etal 2010[12]	Cross sectional study	Group 1 – test group who received orthodontic treatment and had bonded retainers for 2 years. Group 2 – control group who never receivedorthodontic treatment	40 dental students. 20 in test group and 20 in control group	Canine to canine lower retainer	2 years	PI, BOP, GR, CAL, PD. No difference in gingival recession or BOP between groups. Test group had higher CAL values (1.29 + 0.41 vs 1.11 + 0.43) and PD values (1.91 + 0.43 vs 1.07 + 0.11)
N.Pandis et al 2007[13]	Longitudinal study	Group 1 – fixed retainers in lower anteriors for 9.65 years Group 2 – fixed retainers in lower anteriors between 3 – 6 months	64 ; 25 years mean age	Fixed retainers	9.65 years and 3-6 months	PI, GI , Pocket depth and recession. Long term group had higher calculus accumulation, greater marginal recession and increased probing depth ($p < 0.05$)
Frederick. A.Booth et al, 2008[14]	Prospective study	Single group orthodontic patients	60 patients; 20 – 29 years (25 years median)	0.25 in steel wire bonded retainer with bonding to loops in the canines. (3-3). Few of them had 0.32 in twisted wire retainers	20 years	No negative effect on gingival health was noted. Calculus was slightly observed.
Sigrun Zachrissson, 1972[15]	Prospective study	Group1 – Experimetnal group (placed with orthodontic retainers) Group II – Control group (those without any orthodontic treatment)	49 (21 boys and 28 girls) Age at start (12.5 years mean)	Hawley retainer in upper arch used for 3 months used for 24, 16 and 14 hours, then at night for 1 year	1 year	Plaque Index (P1I) and Gingival Index (GI) was evaluated. Scores of GI (1.55 vs1.07 was higher in Group I, but not PI (0.43 vs 0.67). A significant difference was noted in pocket depth between GPI and Gp II (3.36 mm vs 2.86 mm in mesial side and 2.55 mm vs 2.13 mm in distal side) at $p<0.001$

DISCUSSION:

The present review aimed to evaluate the effect of long term fixed retainers on periodontal health. Inconclusive evidence was noted between orthodontic retainers impact on periodontal health as shown in the studies.

Sigrun et al[15] rendered tooth brushing education to both his groups and administered 0.2 percent Sodium Fluoride solution twice a week throughout the evaluation period. This probably could have resulted in lower PI index in their study.

It was interesting to note that participants had improved their oral hygiene techniques following the placement of retainers. .In the study of Jao Batista et al, test group students flossed throughout the period. Clinical attachment parameter too did not show much difference in studies assessed as the sample comprised of young patients complying to good oral hygiene standards. In this regard Artun et al[16] wrote that "The presence of a retainer wire, with occasional accumulation of plaque and calculus, does not seem to prevent satisfactory hygiene along the gingival margin. In this regard, the patient's own attitude and motivation, possibly acquired under the influence of the orthodontist, is probably the main factor."

CAL was recorded in the study of Jao Batista et al[12], which is important as CAL changes are irreversible and cumulative in nature, stressing the significance of removing plaque retentive factors.

But Gingival crevicular fluid when used as a diagnostic aid to assess periodontal health must be interpreted with caution as certain unknown systemic or environmental factors can also influence GCF measurements. A study demonstrated that GCF measurements obtained with 24 hours exhibited low stability and high variability. In spite this issue, the existing body of literature suggests that GCF can be used as proxy measurement for gingival inflammation. Confounding factors such as diabetes, pregnancy, smoking habits, antibiotic treatment and antibiotic medications can alter the composition of GCF[17].

N.Pandis et al[13] assessed the long term (9.65 years) effect of retainer on periodontal outcome. Though studies have assessed effect at different time period such as 3 months, 6 months , 2 years and so on. But a follow up of 3 months period will only carry the risk of inflammatory changes of active appliances overtaken by the retainers. Frequent recalls to monitor changes are suggested.

CONCLUSION:

No sufficient evidence was found for fixed orthodontic retainers affecting periodontal health. Orthodontists must provide detailed guidance regarding importance of fixed retainers following orthodontic treatment. The risks and benefits associated with the use of retainers,

maintenance regimen and regular assessments must be stated to achieve optimum results following orthodontic treatment.

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